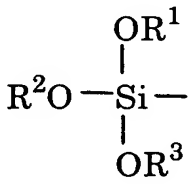
CLAIMS

1. A surface which is characterized in that
(a) it is a biosensor surface to which at least one of the polymers expressed by a general formula,

$$A-(CH_2)_p-L_1-(CH_2CH_2O)_n-L_2-X \qquad (I)$$

[in which

A stands for HS– or  group,

where R^1, R^2 and R^3 each independently stands for C_1–C_6 alkyl,
L_1 stands for a first linker or valence bond,
L_2 stands for a second linker or valence bond,
X stands for hydrogen, a functional group, protected functional group or ligand,
p is an integer of 2 – 12, and
n is an integer of, on the average, 10 – 10,000]
is linked via the A-moiety thereof, and that
(b) the number of the polymer chain per 1 nm^2 of said surface is at least 0.1, as converted from the data obtained by thermogravimetric analysis of said surface.

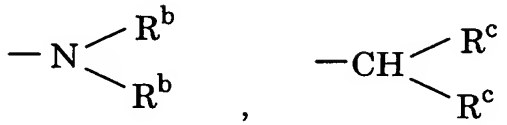
2. A surface according to Claim 1, in which the converted value of the polymer chain number is at least 0.25/nm^2.

3. A surface according to Claim 1, in which, referring to the general formula (I), A is HS group;

L_1 is  (which binds to ethylene oxide unit via the oxygen atom), –O– or –S–; L_2 is a valence bond or

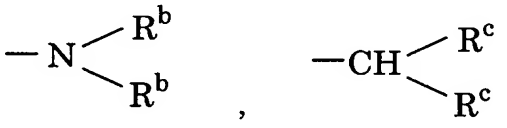
$-(CH_2)_q-$

(wherein q is an integer of 2 – 6); and X is hydrogen atom,



or –COOH (wherein R^b independently stands for hydrogen or C_1–C_6 alkyl, and R^c independently stands for a C_1–C_6 alkyloxy, or two R^c's together form oxy or an optionally C_1–C_6 alkyl-substituted ethylene group).

4. A surface according to Claim 1, in which, referring to the general formula (I), A is $(CH_3O)_3$ Si– group; L_1 is –O–, –NHCOO– (this group binds to ethylene oxide unit via the oxygen atom) or $-N(R^d)-$ (wherein R^d stands for a C_1–C_6 alkyl); L_2 is a valence bond, $-(CH_2)\gamma-$ or $-CO(CH_2)\gamma-$ (wherein γ is an integer of 2 – 6); and X is hydrogen atom,

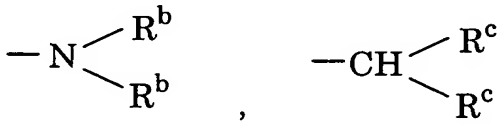


or –COOH (wherein R^b independently stands for hydrogen or C_1–C_6 alkyloxy, and R^c independently stands for a C_1–C_6 alkyloxy, or two R^c's together form oxy or an optionally C_1–C_6 alkyl-substituted ethylene group).

5. A surface according to Claim 1, in which the support of the surface is made of a material selected from the group consisting of gold, silver, copper and aluminum and the converted value of the polymer chain number is at least $0.25/nm^2$.

6. A surface according to Claim 1, in which the support of the surface is made of a material selected from the group consisting of

glass, semi-conductor, ceramic, metal oxide and alloy oxide and, referring to the general formula (I), A is $(CH_3O)_3Si-$ group; L_1 is –O–, –NHCOO– (this group binds to ethylene oxide unit via the oxygen atom) or $-N(R^d)-$ (wherein R^d stands for a C_1–C_6 alkyl); L_2 is a valence bond, $-(CH_2)\gamma-$ or $-CO(CH_2)\gamma-$ (wherein γ is an integer of 2 – 6); and X is hydrogen atom,



or –COOH (wherein R^b independently stands for hydrogen or C_1–C_6 alkyloxy, and R^c independently stands for a C_1–C_6 alkyloxy, or two R^c's together form oxy or an optionally C_1–C_6 alkyl-substituted ethylene group).

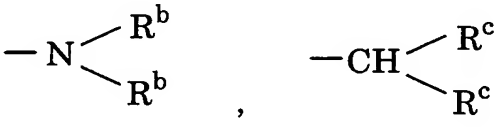
7. A surface according to Claim 1, on which at least two of the polymers of the general formula (I) are linked in combination, one of which has an integer, n, of 10 – 60 as an average value and the other has an integer, n, of 50 – 1000 as an average value.

8. A surface according to Claim 1, in which the polymer chain number per 1 nm^2 of the surface as converted from thermogravimetric analysis data of the surface is at least 0.1; at least two polymers of the general formula (I), in which A is HS group;

L_1 is $-\overset{\overset{O}{\|}}{C}O-$ (which binds to ethylene oxide unit via the oxygen atom), –O– or –S–; L_2 is a valence bond or

$-(CH_2)_q-$

(wherein q is an integer of 2 – 6); and X is hydrogen atom,



or –COOH (wherein R^b independently stands for hydrogen or C_1–C_6 alkyl, R^c independently stands for a C_1–C_6 alkyloxy, or two R^cs together form oxy or an optionally C_1–C_6 alkyl-substituted ethylene group)

are selected in combination, one of which has an integer n of 10 – 60 as an average value and the other has an integer n of 50 – 10000 as an average value; and

the support surface is made of a material selected from the group consisting of gold, silver, copper and aluminum.

9. A method for preparing, of the surfaces as described in Claim 1, those in which the A in the general formula (I) is HS–, which comprises,

(A) a step of contacting an aqueous solution of a polymer expressed by a general formula (Ia),

$$HS–(CH_2)_p–L_1–(CH_2CH_2O)_n–L_2–X \qquad (Ia)$$

(in which L_1, L_2, X, p and n have the same significations to those as defined as to the general formula (I))

with a surface of a metal selected from the group consisting of gold, silver, copper and aluminum, under the conditions sufficient to link a prescribed amount of said polymer to said metallic surface, and thereafter washing away the unlinked polymer.;

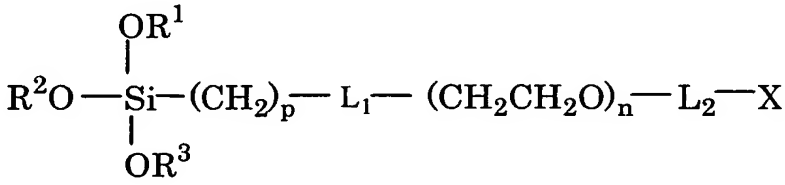
(B) a step of subsequently contacting an aqueous solution of a polymer which may be same or different from the polymer linked to the metallic surface in the above step and which has a small average value of the integer n (i.e., number of ethylene oxide units) with the metallic surface which has undergone the above step A, under the conditions sufficient to link said polymer to said surface, and thereafter washing away the unlinked polymer; and

(C) repeating a step similar to the above step (B) with so obtained surface plural times.

10. The method as described in Claim 9, in which the step (B) and subsequent step or steps are carried out using a polymer differing from that used in the step (A), in the step (A) a polymer whose n in the general formula (I) is, as an average value, 50 – 10,000 being used and in the step (B) and subsequent step or steps a polymer in which the number of ethylene oxide units is less than that of the polymer used in the step (A) by at lest 10 being used.

11. A method for preparing, of the surfaces as described in Claim 1, those in which the A in the general formula (I) is trialkoxysilyl group, which comprises

(A) a step of contacting an organic solvent solution of a polymer expressed by a general formula (Ib),



(Ib)

(in which R^1, R^2, R^3, L_1, L_2, X, p and n have the same significations to those as defined as to the general formula (I)) with a material selected form the group consisting of glass, semi-conductor, ceramic, metal oxide and alloy oxide, under the conditions sufficient to adhere or link a prescribed amount of said polymer to the surface of said material, distilling the solvent off, and washing away the unlinked polymer;

(B) a step of subsequently contacting an organic solvent solution of a polymer which is same or different form the polymer linked to the material surface in the above step and which has a small average value of the integer n (i.e., number of ethylene oxide units) with the surface which has undergone the above step (A) under the conditions sufficient to adhere or link said polymer to said surface, then distilling the solvent off and washing away the unlinked polymer; and

(C) repeating a step similar to above step (B) with so obtained surface plural times.

12. A method for preparing, of the surfaces as described in Claim1, those in which the A in the general formula (I) is HS–, which comprises

(A') a step of contacting an aqueous solution of at least two polymers which are expressed by a general formula (Ia),

$$HS–(CH_2)_p–L_1–(CH_2CH_2O)_n–L_2–X \qquad (Ia)$$

(in which L_1, L_2, X, p and n have the same significations to those as defined as to the general formula (I))

and have the integer n's as average values differing by at least 10, with a surface of a metal selected from the group consisting of gold, silver, copper and aluminum, under the conditions sufficient to link a prescribed amount of said polymers to said metallic surface, and thereafter washing away the unlinked polymers.

13. A method for preparing, of the surfaces as described in Claim 1, those in which the A in the general formula (I) is trialkoxysilyl, which comprises

(A') a step of contacting an aqueous solution of at least two polymers which are expressed by a general formula (Ib),

$$R^2O—\underset{\displaystyle OR^3}{\overset{\displaystyle OR^1}{\underset{|}{\overset{|}{Si}}}}—(CH_2)_p—L_1—(CH_2CH_2O)_n—L_2—X \qquad (Ib)$$

(in which R^1, R^2, R^3, L_1, L_2, X, p and n have the same significations to those as defined as to the general formula (I))

and have the integer n's as average values differing by at least 10, with a material selected form the group consisting of glass, semi-conductor, ceramic, metal oxide and alloy oxide, under the conditions sufficient to adhere or link a prescribed amount of said polymers to the surface of said material, distilling the solvent off, and

washing away the unlinked polymers.